PreCalculus UNIT 2

EXPONENTIALS (MCR) & LOGARITHMS (MHF) – journal questions

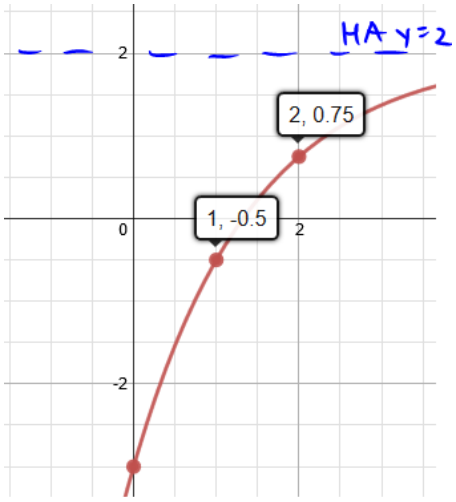
Summarize everything you need to know about these topics. Use examples and concise (not long – but with enough detail) explanations. Include definitions and diagrams if necessary

1. CHANGING FORMATS (MCR)
   a. Explain how $y=-0.5(4)^{6-3x}+8$ can be rewritten so that the exponent is only x. ie. In the form $y=a(b)^{x}+c$ with no 'k' and no 'd'
   b. Explain how $10^{2x}=3^{x+4}$ can be rewritten so that the exponent x appear only in one spot.

2. EXPONENTIAL FUNCTIONS (MCR)
   a. Summarize key information about exponential GROWTH PARENT graph and exponential DECAY PARENT graph. Include sketches, y-int, asymptote, domain, range. (Look at List B exp graphs you've done in UNIT F Functions journal to see if you need to make any corrections/additions)

   b. Explain how to sketch a transformed exponential $y=-192(4)^{\frac{x-6}{2}}-10$ (if you change format like #1a it may be easier to draw)

   c. Discuss how to find an equation of an exponential if y-int and HA is visible.



   d. Discuss how to find an equation of an exponential if y-int and HA is NOT visible.

x	1	2	3	4	5
y	−10	−22	−58	−166	−490

3. LOGARITHMIC FUNCTIONS (MHF)
   a. What is a logarithm? Tie your answer to inverse of exponential and to the fact that a log is "the" exponent. Show several examples of evaluating different logs without a calculator: i) $\log_2 16$ ii) $\log_2 \frac{1}{64}$ iii) $\log_3 \sqrt[7]{9}$ iv) $\log_{\frac{1}{7}} 49^2$ v) $e^{\log_{e^2}(2)}$
   b. What is a good way to remember the switch form rule? $\boxed{y=b^x \Leftrightarrow \log_b(y)=x}$
   c. Summarize key information about 'LOG GROWTH' parent graph and 'LOG DECAY' parent graph. Include sketches, x-int, asymptote, domain, range. (Look at List B log graphs you've done in UNIT G Functions journal to see if you need to make any corrections/additions)
   d. Explain how to sketch a transformed logarithm. Label VA, x and y intercepts $y=-\frac{1}{2}\log_2(x+4)-1$
   e. Discuss what each of the following represent: $\ln x$ and e^x
   f. Explain how to find the domain of $\log(x^2-3x-4)$

4. LOG LAWS (MHF)
   a. Copy all of the properties of Logs and make notes about COMMON mistakes made with each one of the above properties and try to avoid those

$$\boxed{\log_b(x \overset{\times}{\div} y)=\log_b(x) \overset{+}{-} \log_b(y)} \qquad \boxed{\log_b(x)^n = n\log_b(x)} \qquad \boxed{\log_b(x)=\frac{\log_{\#} x}{\log_{\#} b}} \qquad \boxed{\log_b(b)^x = x} \qquad \boxed{b^{\log_b(x)} = x}$$

   b. Show an example of how to EXPAND an expression with one log term into many logs terms with no exponents on inputs and no more brackets

$$\log_a\left(\frac{x}{\sqrt{xy}}\right)^{\frac{1}{4}}$$

   c. Show how to CONDENSE log terms into a single log with no negative powers $-2\log_a x^2-\frac{1}{2}\log_a y+\frac{1}{5}\log_a z$

   d. CHANGE BASE examples
      i. Show how to change $y=\log_3 x$ into log of base 9 and simplify what you can
      ii. Show how to change $y=8^x$ into exponential of base 11

5. SOLVING

a. Solve EXPONENTIAL Equations + explain what strategy is best (switch form, match bases, or replacement) and why (MCR)

i. $3^{2x-5}=1$

ii. $7\cdot 49^{2x}\cdot 49^{3-x}=\left(\frac{1}{343}\right)^{x+5}$

iii. $3^{x+3}-3^{x}=234$

iv. $4\left(3^{x}\right)+3^{2x}=-4$

v. $3^{x}=12$

vi. $2^{x}=3^{x+1}$ see 3versions of solutions online, pick your favourite to record www.mrsk.ca/AP/SolveExpInDiffWays.pdf

b. Solve LOGARITHMIC Equations + explain (MHF)

i. $\log_{x}8=\frac{1}{4}$

ii. $\log_{3}x^{5}-\log_{3}x=12$

iii. $\log_{9}\frac{9}{5}x=\log_{9}\frac{63}{10}+\log_{2}4^{-2}$

6. REAL LIFE

Applications with Exponentials (MCR)

a. Copy the following into your journal:

The formula most commonly used for exponential word problems is: $y=ab^{\frac{x}{p}}$. where

x = value of the independent variable, usually time
y = final value of the dependent variable
a = initial value of the dependent variable
b = growth/decay factor, found by looking at special words or converting % rate to a factor
- b=2 for 'double in value'
- b=1/2 for 'half-life'
- b=1+r if r% is rate increase
- b=1-r if r% is rate decrease

p = how long it takes for 'a' to grow/decay by factor 'b'

NOTE: always set up the equation with two variables, x and y (explain what they represent) and *then* sub in more info to solve it. If you sub in prematurely you may get confused.

b. Clarify the differences between factor versus rate $f\left(x\right)=5\left(1.9\right)^{x}$, $g\left(x\right)=200\left(0.45\right)^{x}$

c. Ex of % word problem

A drug's mass in the blood stream decreases as time passes. Each hour the 250mg drug loses 5% of its effectiveness. What is the mass of the drug after 150 minutes? How long will it take for the dose to reach the low level of 52mg?

d. Ex of Double/Half life word problem:

Health officials found traces in radium-F beneath the local library. After 69 days they observed that a certain amount of the substance decayed to $\frac{1}{\sqrt{2}}$ of its original mass. Determine the half-life of radium-F.

Applications with Logarithms (MHF)

e. Copy the following into your journal:

$pH=-\log\left(H^{+}\right)$

H^{+} is measured in mol/L

$L=10\log\left(\frac{I}{I_{0}}\right)$

I_o is threshold of human hearing = 10^{-12} watts/m^2

$M=\log\left(\frac{I}{I_{0}}\right)$

I_o is reference earthquake = 10^{-4} cm = 1micron on the seismograph

For comparisons:

$pH_{2}-pH_{1}=-\log\left(\frac{H^{+}_{2}}{H^{+}_{1}}\right)$

$L_{2}-L_{1}=10\log\left(\frac{I_{2}}{I_{1}}\right)$

$M_{2}-M_{1}=\log\left(\frac{I_{2}}{I_{1}}\right)$

f. Example of pH:

Find the pH of a solution with hydronium ion concentration of $4.5\text{x}10^{-5}$

g. Example of decibels:

Anna can scream at 56 db and Billy can yell at 48 db. How many more times intense is Anna's scream than Billy's yell?

h. Ex of earthquake magnitudes:

On September 26, 2001, an earthquake in North Bay measured 5.0 on the Richter scale. What's the magnitude of an earthquake 3 times as intense as North Bay's earthquake?